ACHIEVING MEASURABLY BETTER HEALTHCARE PERFORMANCE

Integrated Clinical Care Strategy Improves Emergency Patient Flow

The Royal Wolverhampton NHS Trust
Wolverhampton, United Kingdom

Emergency departments (ED) face increased pressure to improve performance, reduce overcrowding, and shorten wait times. Patient wait times within the ED that exceed four hours from arrival to discharge, trigger substantial institutional penalties.[1] Faster triage must not supersede the need for accuracy. For these reasons, it is critical to develop optimized clinical pathways that ensure high levels of patient safety while maximizing speed to diagnosis and care management.

The Royal Wolverhampton National Health Service (NHS) Trust initiated a novel integrated clinical care project to optimize pathways for patients with suspected Acute Coronary Syndrome (ACS). Identification of low-risk patients using clinical assessment and high sensitive troponin values measured on arrival enabled a discharge protocol that reduced the number of low-risk patients admitted unnecessarily and ensured patient safety. Implementation of this pathway has favorably impacted multiple key performance indicators (KPIs) such as reduced mean length of stay and reduced healthcare costs from unnecessary admissions.

The Royal Wolverhampton NHS Trust's success is an example of a multi-disciplinary clinical care program with measurable benefits to patients, clinicians, administrators, and payors.

PATIENT

CLINICIAN

HOSPITAL ADMINISTRATION

PAYOR

KEY PARTNERS / STAKEHOLDERS

Clare Ford, PhD
Consultant Clinical Biochemist and Head of Clinical Chemistry

Katherine Willmer, MD
Consultant Acute Physician

Simon Whitehead, PhD
Principal Clinical Scientist

Andy Morgan, MD
ED Consultant and Clinical Director of Emergency Services

SITUATION ANALYSIS

- Emergency Department (ED) crowding is a problem with increasing international attention.[1]
- Inefficient ED processes can result in increased ED wait times, decreased patient satisfaction, and unfavorable ripple effects throughout the hospital.[1]
- Prolonged ED length of stay increases the risk of poor outcomes.[2]
- Penalties can be incurred when national guidelines for wait times and time to treatment targets are not met.[3]

INTEGRATED CLINICAL CARE STRATEGY IMPROVES EMERGENCY PATIENT FLOW

DISCOVERY

Approximately 10% of the ED population at The Royal Wolverhampton NHS Trust is comprised of patients experiencing chest pain. Opportunities existed to improve patient triage through the ED. To replace clinical assessment with peak troponin at 12 hours, a thorough evaluation of chest pain protocols such as cardiac diagnostics at the point of care and/or use of a novel high sensitive troponin-I assay (hsTnI) occurred.

NOVEL EVIDENCE SUPPORTED THE USE OF HS-TNI ON ARRIVAL IN ED IN LOW-RISK PATIENTS PRESENTING WITH ACS SYMPTOMS TO SAFELY RULE OUT ACUTE MYOCARDIAL INFARCTION (AMI) FASTER THAN TRADITIONAL METHODS.[4]

HYPOTHESIS

New clinical pathways for patients with suspected ACS could improve patient flow within the ED. Clinical assessment and a multifactorial algorithm using hsTnI would enable an earlier rule out (discharge) and earlier rule in (admission) of Acute Myocardial Infarction (AMI).[5]

1. Safe rule out of AMI based on a low clinical risk and low levels of high sensitive troponin less than or equal to a predefined threshold set at the analytical noise level of the assay (Limit of Detection or LoD) on the arrival sample.
2. Rule in of AMI based on a higher clinical risk assessment, elevated troponin values and delta differences (rise and/or fall) of serial hsTnI measurements using collection times upon arrival and at three hours*. Troponin elevations were characterized in accordance with guideline recommendations using the 99th percentile of a normal reference population.[6]
3. Admission of high-risk patients and transfer of low-risk patients with an arrival hsTnI value greater than the LoD to a newly formed triage area or clinical decision unit (CDU) within the ED to await serial troponin results and further clinical evaluation.

It was hypothesized that implementation of this new clinical pathway would reduce length of stay and associated costs, improve emergency triage, while maintaining high levels of patient safety.

**Serial timing was previously measured upon arrival and six hours later*

PARTNERS

A cross-disciplinary team comprised of cardiology, emergency medicine, acute medicine, and pathology collaborated to align on safe and effective patient pathways that included clinical assessment and strategic use of cardiac biomarkers. A key challenge with any new algorithm is physician compliance. This is especially true in emergency situations where physicians had personal experience with previous pathways. To alleviate these concerns and drive cadence to the new program, laboratory medicine partnered with emergency medicine and cardiology for educational forums and grand rounds on the evidence-based safety and benefits of the new process.

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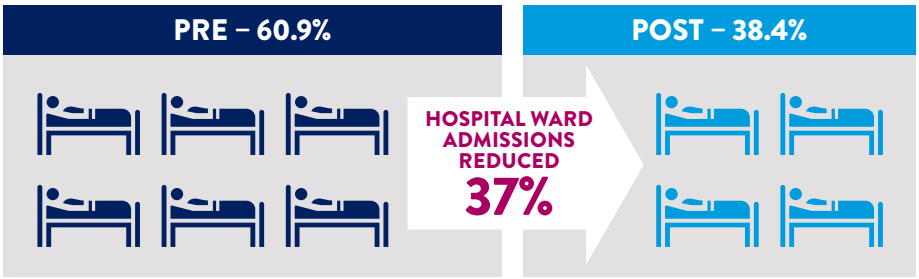
EXECUTION

Development and implementation of the novel chest pain pathway involved cross-functional collaborative efforts that included – adoption of new technology, assessment of patient flow throughout the ED, creation of a Clinical Decision Unit (CDU) within the ED, application of core lab instrumentation, as well as Thrombolysis In Myocardial Infarction (TIMI) based screening criteria for ED physicians to utilize. Patient safety was considered the foremost important goal. After verification, testing, education, and audits the team confirmed a best in class algorithm was safe and effective.

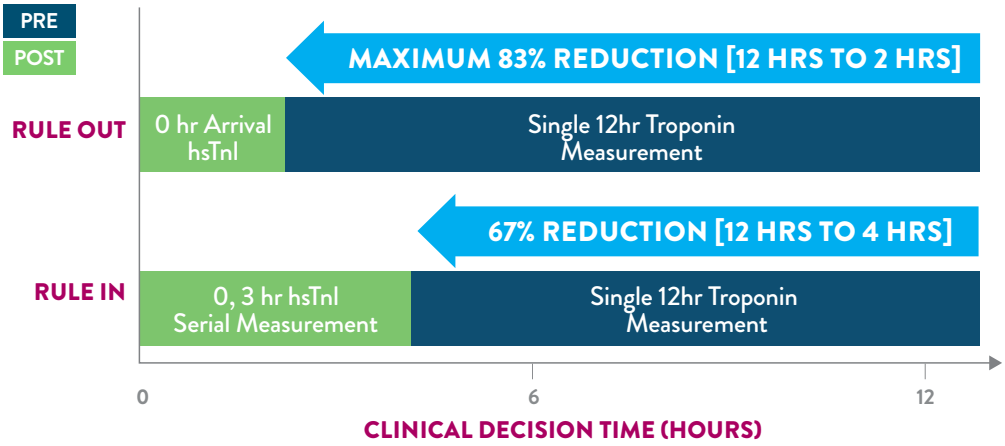
PROOF OF VALUE

REDUCED HOSPITAL ADMISSIONS POST IMPLEMENTATION



- Improved Patient Satisfaction as measured by the increase in percentage of low-risk patients attending the ED with possible ACS who were discharged following an arrival (baseline) hsTnI less than or equal to the LoD.

IMPROVED CLINICAL DECISION TIME TO RULE IN AND/OR RULE OUT AMI



- Safe for patients as measured by quantitating major adverse cardiac (MACE) events for patients with an arrival hsTnI of ≤ LoD at 30 days and nine months.
- Reduction in the mean length of stay from arrival to discharge.
- No increase in cardiology consults despite implementation of very stringent hsTnI cut points.

SUCCESS FACTORS

- High sensitivity cardiac troponin is the preferred biomarker for the diagnosis of myocardial injury.[7]
- Rapid rule out strategies for low risk patients with suspected ACS and hsTnI values less than the limit of detection using the Abbott ARCHITECT hsTnI assay can be safe, timely and highly effective.[4,7]
- Implementing a system-wide cross discipline educational strategy is ideal to ensure understanding of and adherence to new clinical pathways.

SPOTLIGHT ON STAKEHOLDER SUCCESS

PATIENT	IMPROVED **PATIENT EXPERIENCE**	• Safely discharged over 25% of low-risk patients without the need for serial measurements of cardiac troponin. • Time to discharge for some low-risk patients was reduced by approximately 6-fold (12 to 2 hours on average).
	HIGH DEGREE OF **PATIENT SAFETY**	• No ACS related deaths associated with using single hsTnI values to discharge low-risk patients after ED presentation. • The negative predictive values (NPV) of baseline hsTnI ≤ LOD for MACE at 30 days and 9 months were 99.8% and 99.5%, respectively.*
CLINICIAN	IMPROVED **CLINICIAN CONFIDENCE**	"Implementation of our novel ACS pathway utilizing high sensitivity troponin has improved our confidence in safely discharging low-risk patients while admitting high-risk patients with minimal impact to the rate of cardiology consults. As a benefit of the improved sensitivity and specificity of hsTnI, I am more confident in the ability to risk stratify patients with ACS earlier in their pathway." *–Katherine Willmer, MD The Royal Wolverhampton NHS Trust* No unwarranted increase in Cardiology consults (false positives) due to stringent hsTnI rule in algorithm (process).
HOSPITAL ADMINISTRATION	REDUCED **LENGTH OF STAY**	Total length of stay for patients from arrival to discharge was reduced from 23 hours to 9.6 hours (a 2+ fold reduction).
	REDUCED **UNNECESSARY ADMISSIONS**	Admissions from the ED to the hospital wards were reduced by 37% (from 60.9% to 38.4%).
PAYOR	REDUCED **COSTS**	Unnecessary hospital admissions create a burden to healthcare system. The new ACS patient process at The Royal Wolverhampton NHS Trust reduced the annual healthcare spend by approximately £788,000 due to reduced admissions with safe and fast high-quality care.

*Deaths from unrelated causes, e.g., malignancy have been excluded

1. Jayaprakash N, et al. Crowding and Delivery of Healthcare in Emergency Departments: The European Perspective. *West J Emerg Med*. 2009; 10(4): 233-239.
2. Filippatos G, Karasi E. The Effect of Emergency Department Crowding on Patient Outcomes. *HSJ*. 2015; 9(1): 1-6.
3. The Sustainability and Transformation Fund and financial control totals for 2017/18 and 2018/19: guidance (Indicative). NHS Improvement Web Site. https://nhsicorporatesite.blob.core.windows.net/green/uploads/documents/STF_and_Financial_CT_1718_1819_Guidance_Indicative.pdf. Published December 22, 2015. Updated April 18, 2018. Accessed April 20, 2018.
4. Rubini GM, et al. Rapid rule out of acute myocardial infarction using undetectable levels of high sensitivity cardiac troponin. *Int J Cardiol*. 2013; 168: 3896-3901.
5. Ford C, et al. Benefits of High Sensitivity Troponin I at Admission. *Clinical Laboratory Management Association*. 2017; 6(6): 20-24.
6. Thygesen K, et al. Third universal definition of myocardial infarction. *Eur Heart J*. 2012; 33: 2551-2567.
7. National Institute for Health and Care Excellence (2014). Myocardial (acute): Early rule out using high sensitivity troponin (Elecsys Troponin T high sensitive, ARCHITECT STAT High Sensitive Troponin-I and AccuTnI+3 assays). (DG15).